Conservation Reserve Enhancement Program Application
Montgomery County, Maryland

Program Category #14: Information Technology

1.0 Abstract

The Montgomery County (MC), Maryland Department of Technology Services - Geographic Information Systems (DTS-GIS) team, in cooperation with the Department of Environmental Protection (DEP), developed an ArcView GIS based Conservation Reserve Enhancement Program (CREP) application. The application provides the Montgomery County Soil Conservation District (SCD) the means to save a significant amount of time and makes the task of targeting eligible farms for CREP funding and marketing the CREP program to the farmland owners more efficient. The CREP application provides the ability to select the target farm by address or geographic location. In doing so, the application will start to process and analyze factors based on the geographical data associated with the target property, such as streams, wetlands, soil rental rates . SCD staff need only click a button and then choose a property to obtain the attributes of the target property to realize if this property is a candidate for the CREP program. The MC geographic data presented in the CREP application reflects information downloaded daily, weekly, or quarterly by DTS-GIS.

2.0 Need for the Program

County DEP has been assisting SCD with the CREP program. CREP is a voluntary federal program that offers annual rental payments and cost share assistance to establish woodlands or grasslands on eligible crop land. Up to very recently, it could take SCD staff several days or even weeks of hand overlaying and hand planimetry (with ruler or line follower) to establish the base maps for use with the target property. As a result, only a very small number of crop lands could be examined each year.

Consequently, DEP staff asked DTS-GIS to create a GIS-based application to reduce the complexity of creating target property maps and to provide a sophisticated, yet simple application, to allow SCD staff to quickly locate, process and determine the eligibility of a target property in Montgomery County. As a result, DTS-GIS developed the CREP application to enable SCD staff to quickly locate a County property based on the input of an address or geographic location. The application was also created to provide additional information about the target property and to include a tool for making a map for an application as a candidate for the USDA CREP program.

3.0 Description of the Program

The CREP application was designed and tested on the Environmental Systems Research Institute (ESRI) GIS software ArcView, and the Microsoft Internet Explorer web browser. After a few tutorials and revisions, the CREP application was approved to DEP staff and is installed on the DEP PC workstation, soon to be installed on the SCD PC. The following sub-section describes the process used to develop and maintain the CREP application.

Step 1: Establish functional requirements

Upon a request from the DEP staff, DTS-GIS was provided with functional requirements for the CREP application in June of 2000. The application was to provide quick calculations of geographical and associated attribute data of the target property selected by the SCD staff member. The geographic data layers used include property, streams, wetlands, watersheds, natural features, land cover, soils and an ortho-photo of the property. In addition, SCD staff was to be able to create a map that contained the necessary attribute information for application to the USDA CREP program. GIS database attributes provided were, for example, soil rental rate , the land use codes, and acreage of the target property. The map layers needed for the project are chosen automatically in the application and are then downloaded from the computer's hard drives.

The application was to be installed on designated PC's at DEP and MC SCD. These PC's were to be Local Area Network (LAN) connected so that users could access the GIS data live or have the most current data downloaded to the application on the hard drive for speed of use. The data provided by the CREP application is to be updated periodically by DTS-GIS.

Step 2: Collect data, documents, and information

DTS-GIS is the clearing house for all the needed geographic and attribute data to operate the CREP application. Geographic data is provided by DTS-GIS in ArcInfo coverages and (ArcView) shapefiles. The data layers include, but are not limited to, property, streams, wetlands, watersheds, natural features, land cover, soils and ortho-photos. These data layers are updated quarterly, semi-annually, or annually and then go through quality control checks. The updated data are then imported to the CREP application. Other useful geographic attributes for the displaying and mapping of the target property locations include soil rental rate , the land use codes, and acreage.

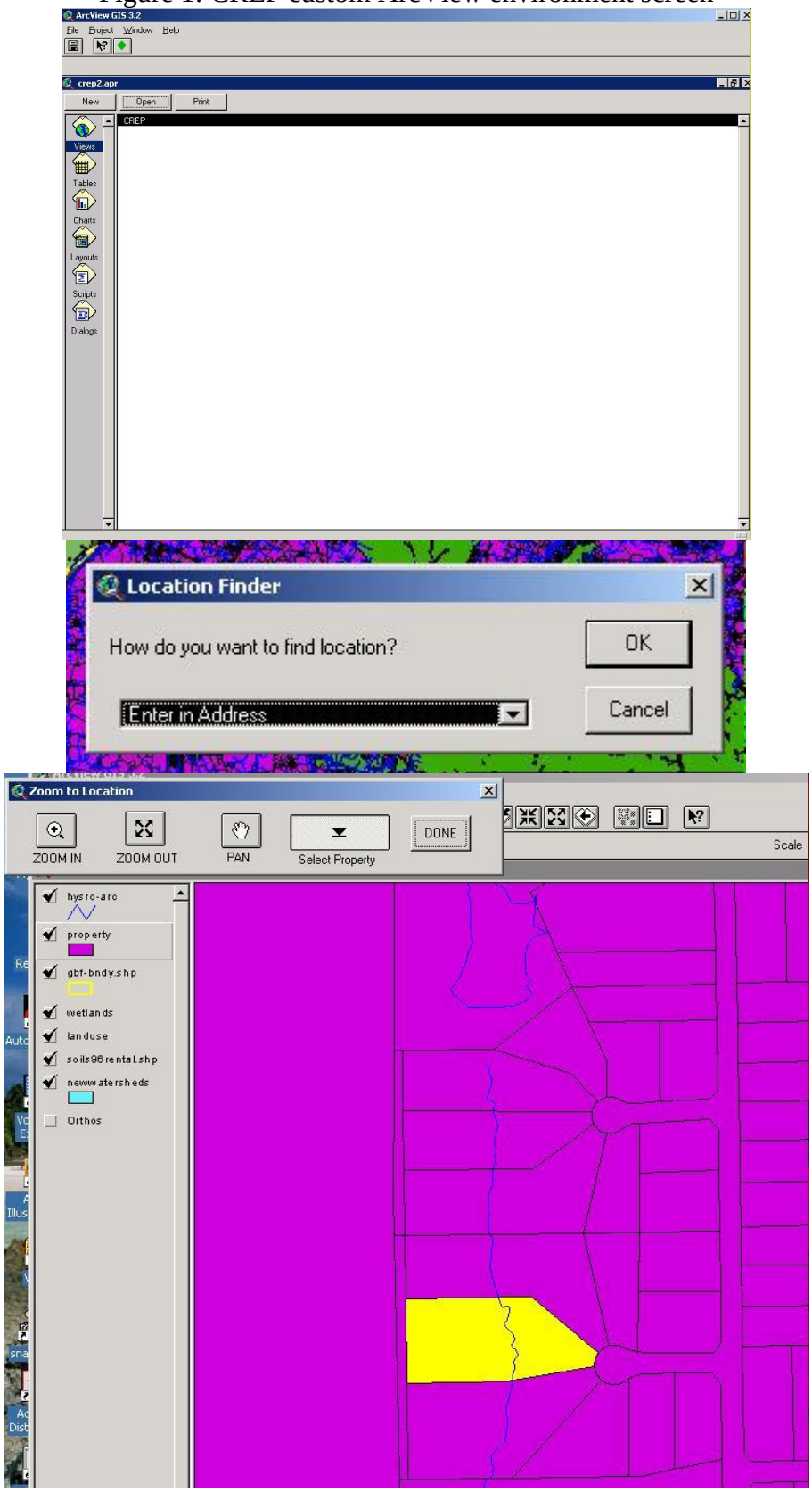
Detailed CREP application instructions and sample output graphics were provided in hard copy format for easy reference. Tutorial classes were also be provided to SCD staff by DTS-GIS.

Step 3: Programming and Creating the CREP Application

The application was programmed with Avenue scripting using ESRI's ArcView software development environment. The geocoding (i.e., assigning coordinates to street addresses or intersections) capability was also provided by the ArcView software. Finally, ArcView software was used to display the final map and query result to be printed. The application was initially tested on a Dell Optiplex GX300, Pentium 3 computer with Microsoft Windows NT 4.0 operating system.

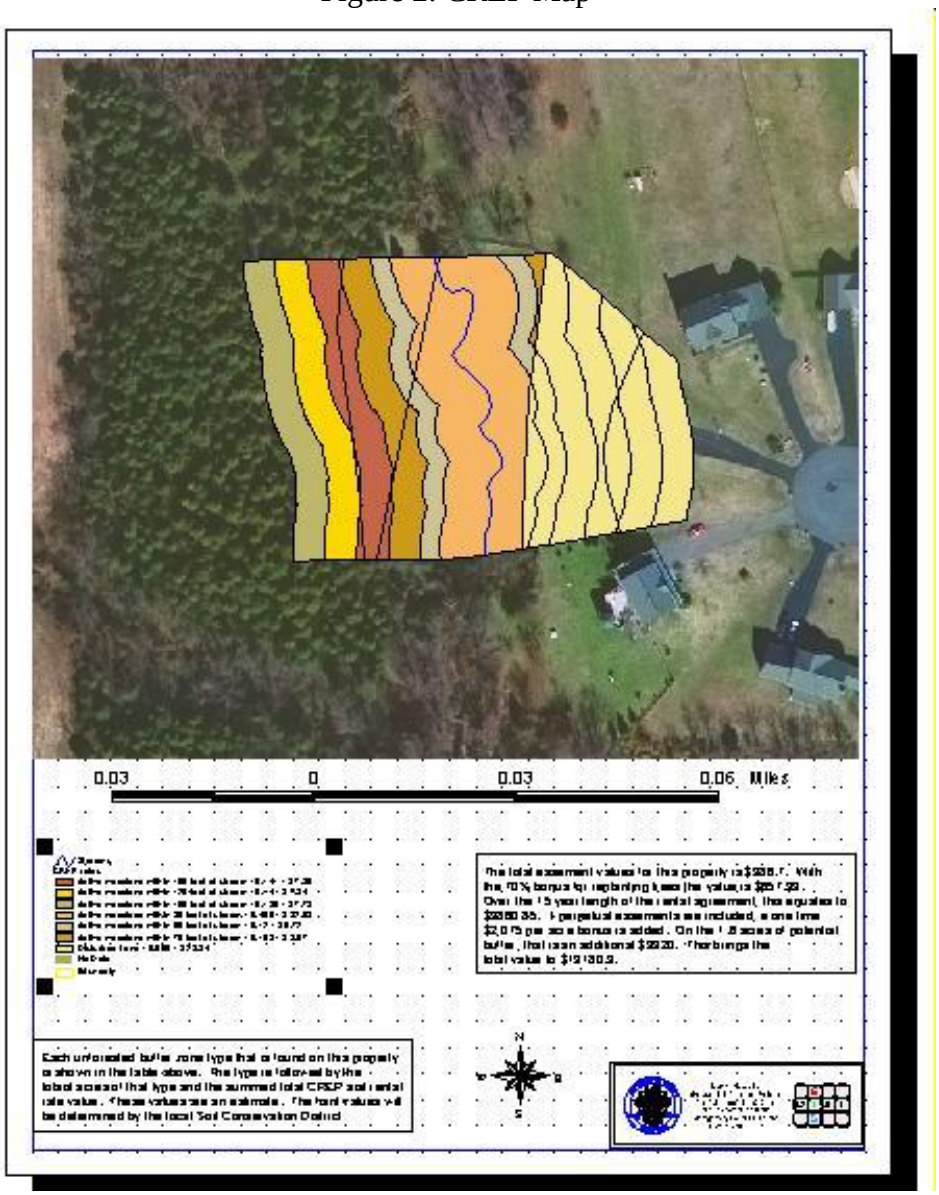
Unlike the 'busy' standard ArcView interface, the much simplified CREP application interface is generated by one functional button, yes or no message boxes and simple input boxes to enable SCD staff to quickly and easily review the results of their query (Figure 1).

Figure 1: CREP custom ArcView environment screen



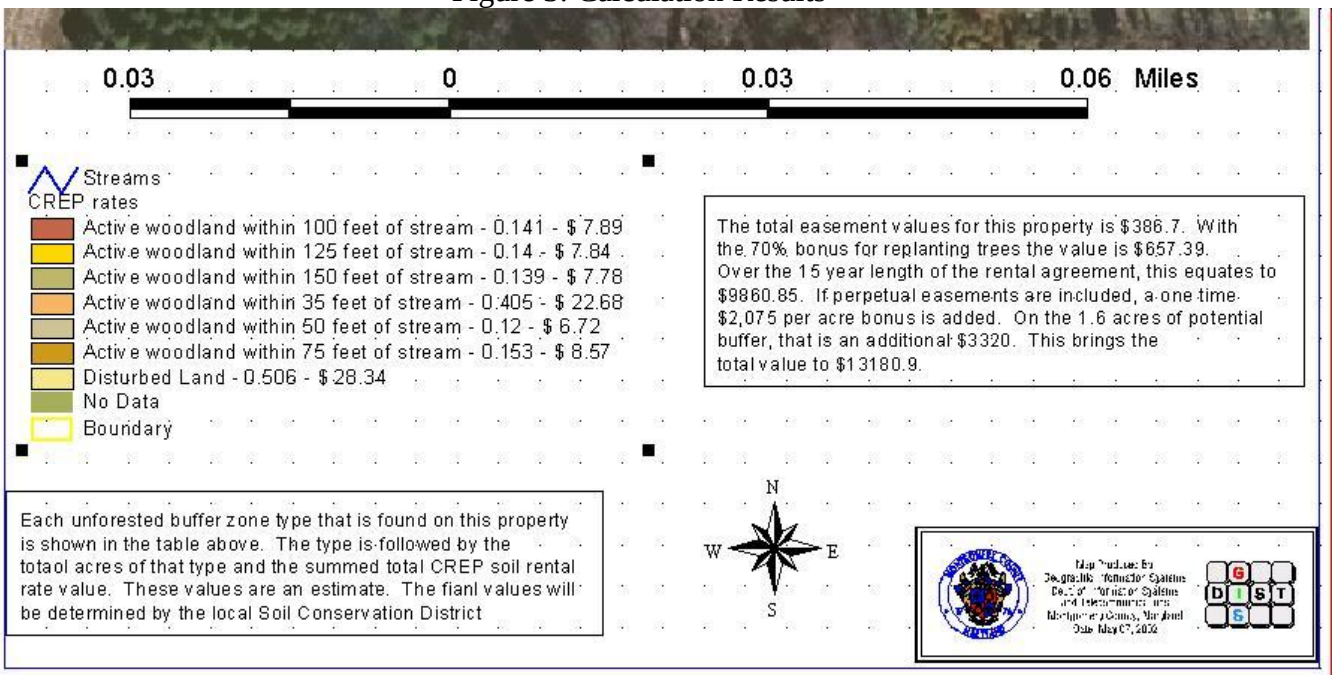
The CREP application was designed to perform calculations based on geographic attributes quickly, select relevant geographic data layers for composing a map and display all the relevant database information associated with a particular target property. The SCD staff selects the candidate property through entering an address in the input box of the target property or by clicking on a location on the map with the mouse. The application then uses the target property boundary to clip out the geographic layers, including streams and wetlands. It then generates buffers around the clipped layers with distances of 35, 50, 75, 100, 125, and 150 foot bands. It then performs a union operation on the bands to create a single composite layer. It then uses the single layer to create a master soil coverage, combines layers and attributes for final rental rates by land cover and buffer, and finally determines types of land based on attribute combinations. When the process is complete it produces a map of the information obtained through these complex steps and is ready for submittal to the USDA CREP program. (Figure 2).

Figure 2: CREP Map



The final soil rental rates resulting through the application steps are shown at the bottom of the map. (Figure 3)

Figure 3: Calculation Results



Step 4: Review and revise CREP Application

DEP staff reviewed and provided recommendations of changes/enhancements for the application during the period of July, 2001 through July, 2002. These recommendations were incorporated into the application by DTS-GIS and the application was approved by DEP staff in October of 2002.

Step 5: Install CREP Application on one DEP PC

The CREP application has been installed on one PC. The appropriate disk drives of the database server have been connected to the PC so that live updates and downloads may take place directly from the DTS-GIS databases. DEP GIS staff has been trained in the use of this application. This person will provide day-to-day support to the MC SCD staff in the use of CREP application.

Step 6: Maintain application content

The required geographic data from MC and other sources, such as streams and properties, are downloaded by DTS-GIS to the database server on a quarterly basis. The data is then reviewed and prepared for input into the CREP application by DTS-GIS. The application content including GIS shape files, property data and ortho-photos will be updated annually by DTS-GIS. The system administration aspects of the application are also provided by DTS-GIS.

4.0 Use of Technology

The application was initially created and tested on a Montgomery County Government DTS-GIS Pentium 3 PC computer with Microsoft Windows NT 4.0 operating system, running ESRI's ArcView software.

ESRI's ArcView programming language, Avenue, was used as the application development environment to design, program, and test scripts used to create the CREP application.

Since this application is developed on top of the widely used ArcView GIS platform, it is relatively easy to plug in and port to SCD PC workstations.

5.0 The Cost of the Program

The total cost to develop the DEP CREP application including staff time (programming and data maintenance) and software/hardware equipment was approximately $20,000.
Approximately 200 hours of staff time was invested into the development of the application at a cost of $5,500. The high-end PC workstation and GIS software cost approximately $10,000. Maintenance cost will vary according to staff salary. It is estimated at $4,500 so far.

In order for an SCD staff member to effectively use the application, a Pentium 933 MHz or better Intel-based personal computer is recommended. The operating system can be Windows NT, 2000, or XP along with ESRI's ArcView GIS software. A LAN connection is recommended in order to download recent data.

6.0 The Results/Success of the Program

This application grew out of a need to assist the MC SCD staff with developing a method to use GIS capabilities to target and market the CREP program. Thus, the need for developing the application was evident. Instead of spending week(s) to examine a few candidate crop lands in the past, the GIS-based CREP Application now enables MC SCD staff to perform such an examination in minute(s). More candidate properties can be examined before picking the final ones for CREP funding submission. Furthermore, calculations based on accurate GIS data layers are more accurate as compared to the old methods of using ruler, line follower, pen and paper.

The positive results of this application consist of a simple and uncomplicated way for SCD staff to query, map and report the important geographic information surrounding a target property. The application will also help reduce the demand on staff time in responding to the needs of the SCD staff in enrolling target properties into the USDA CREP program.

7.0 Worthiness of an Award

The MC CREP application provides SCD staff with tools to search, display, map or report eligible property in minutes rather than hours or days. Consequently, it is anticipated that the implementation of this application will replace the need to manually calculate the location of a

potential property, one by one, thereby resulting in a significant savings in staff time and retrieving a larger amount of geographic data within the area of interest. The delivery of geographic data surrounding a target property empowers SCD staff to find the pertinent geographic data that fits their needs. As a result, SCD staff time, in this otherwise time consuming task, is minimized.

The CREP application exemplifies cooperation between County, State, and federal agencies to use geographic data layers that were created for many uses. It has improved the functionality of complex calculations to be more efficient and has increased utilization. This process will assist MC in increasing the amount of land that is dedicated to conserving water quality and increase the use of the USDA CREP funding in Montgomery County and across the State.